

A new species of the genus *Hoplias* (Characiformes, Erythrinidae), a tararira from the lower Paraná River, in Misiones, Argentina

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► **Abstract** — We describe *Hoplias mbigua*, a new species of the genus from the lower Paraná, in Misiones, with tooth-bearing plates on dorsal surface of basihyal and basibranchials and medial margins of contralateral dentaries converging towards the mandibular symphysis in ventral view, characters that permit to include the species in the *H. malabaricus* group. The presence of five brown bands transversely placed on lower jaw distinguishes the new species from its congeners, excluding *H. microlepis* (vs. lower jaw straight or with small black or brown dots uniformly distributed). The number of circumpeduncular scales in *H. mbigua* is 20 whereas *H. teres* and *H. malabaricus* have 18 circumpeduncular scales and *H. microlepis* 22–24 and 12–16 gill rakers on first epibranchial (vs. about 9). *Hoplias mbigua* has convex dorsal profile between head and dorsal fin whereas *H. teres* has straight dorsal profile. *Hoplias mbigua* has a large supraopercle, with its anterior margin contacting the infraorbitals 5 and 6 whereas *H. cf. malabaricus* has a short supraopercle, with an anterior margin scarcely extended before anterior opercular margin. *Hoplias mbigua* has a large tooth-plate on basihyal and basibranchials instead of two lines of tooth-plates at sides of bones in *H. cf. malabaricus*.

Keywords: Characiformes, *Hoplias*, lower Paraná.

► **Resumen** — “Una nueva especie del género *Hoplias* (Characiformes, Erythrinidae), una tararira del Río Paraná bajo, en Misiones, Argentina”. Describimos *Hoplias mbigua*, una nueva especie del género, procedente del bajo Paraná en Misiones, con dientes en la superficie dorsal de los basibranchiales y basihial y los márgenes del dentario convergiendo hacia la sínfisis mandibular en vista ventral, caracteres que permiten incluirla en el grupo de *H. malabaricus*. La presencia de 5 bandas pardas transversales en la mandíbula inferior distinguen esta especie de sus congéneres, excluyendo *H. microlepis* (vs. mandíbula inferior lisa o con pequeñas manchas negras o pardas uniformemente distribuidas). El número de escamas circumpedunculares en *H. mbigua* es 20 mientras que *H. teres* y *H. malabaricus* tienen 18 y *H. microlepis* 22–24 escamas circumpedunculares y 12–16 rastrillos branquiales en el primer epibranchial (vs. alrededor de 9). *Hoplias mbigua* tiene perfil dorsal convexo entre cabeza y aleta dorsal y *H. teres* tiene perfil dorsal recto entre cabeza y aleta dorsal. *Hoplias mbigua* tiene supraopérculo grande, con su margen anterior en contacto con los infraorbitales 5 y 6 mientras *H. cf. malabaricus* tiene supraopérculo corto, con el margen anterior apenas extendido delante del margen anterior del opérculo. *Hoplias mbigua* tiene placa grande con dientes, sobre basihial y basibranchiales en lugar de las dos hileras de placas dentadas en los laterales de los huesos en *H. cf. malabaricus*.

Palabras clave: Characiformes, *Hoplias*, bajo Paraná.

INTRODUCTION

The species of the characiform genus *Hoplias* (known as tarariras or taruchas in Spanish) have a broad distribution in South America, being used in fisheries and sport activities in many places. Oyakawa and Mattox (2009) used morphological characters to define three species groups within *Hoplias*: *H. lacerdae*, *H. malabaricus*, and *H. macrophthalmus* groups. The *H. lacerdae* group was defined by the absence of tooth-bearing plates in the fleshy tissue on the dorsal surface of the basihyal and basibranchials and by the medial margins of contralateral dentaries lying almost parallel to each other. The group of *H. malabaricus* is still undefined but it may be recognized by the presence of tooth plates in the tongue (basihyal) and the medial margins of contralateral dentaries forming an acute angle. Mattox *et al.* (2014) pointed out that the *H. malabaricus* group includes at least three species: *H. malabaricus*, *H. microlepis* and *H. teres*. The third group contains a single species, *H. aimara*, characterized by the absence of an accessory ectopterygoid and the presence of a dark oval spot on the opercular membrane. So far, *H. malabaricus* is the most common species found in the lower Paraná River. *Hoplias lacerdae* (Rosso *et al.*, 2013) and *H. australis* (Oyakawa and Mattox, 2009) are recorded from the lower Uruguay River; the two species belong to the *H. lacerdae* group. The objective of this paper is the description of a new species of the *H. malabaricus* group, adding morphological information.

MATERIAL AND METHODS

The description of the new species is based on 44 specimens housed at different collections and hundreds of specimens measured and sexed for ecological studies by the members of the Proyecto Biología Pesquera Regional. Meristic and morphometric data were taken in 16 specimens; all measurements were taken point-to-point with digital calipers to 0.1 mm. Number of specimens is presented in parentheses, the asterisk in the

meristic characters indicates the holotype. Measurements and counts were taken on the left side of body, whenever possible, following Mattox *et al.* (2006). Osteological names follow Oyakawa and Mattox (2009). Institutional abbreviations follow Sabaj Pérez (2014), excluding Laboratorio de Genética Evolutiva, Instituto de Biología Subtropical (LGE-P, IBS Conicet-UNaM), and Proyecto Biología Pesquera Regional (IBS Conicet-UNaM, named here as Anexo, pending collection). Information of *H. microlepis* was taken from Mattox *et al.* (2014).

COMPARATIVE MATERIAL
EXAMINED

Hoplias malabaricus ZMB 3515, lectotype, South America, probably Suriname. Lectotype designated by Paepke (1999). *Hoplias teres*, MNHN 0000-4377, 2 exs., syntypes, Lake Maracaibo, Venezuela. *Hoplias mbigua*: All specimens from Misiones, collected by Staff of Proyecto Biología Pesquera Regional. Anexo 001, 2 exs., 223-254 mm SL (standard length, snout to hypural joint), río Paraná in Garupá, November 2013. Anexo 002, 4 exs., 172-310 mm SL, río Paraná in Garupá, June 2014. Anexo 003, 1 ex., 45 mm SL, río Paraná in Nemesio Parma. Anexo 004, 2 exs., 48-54 mm SL, río Paraná in Nemesio Parma, April 2002. Anexo 005, 4 exs., 165-294 mm SL, río Paraná in Nemesio Parma, November 2003. Anexo 006, 2 exs., río Paraná in Nemesio Parma, June 2002. Anexo 007, 2 exs., 162-230 mm SL, río Paraná in Nemesio Parma, October 2013. Anexo 008, 1 ex., 76 mm SL, río Paraná in Corpus, August 2009. Anexo 009, 3 exs., 234-282 mm SL, arroyo Yabebiry, May 2014. Anexo 010, 6 exs., 172-318 mm SL, arroyo Yabebiry, November 2013. FML-CI 6765, 1 ex., 280 mm SL (dried disarticulated skull), Argentina, Provincia de Misiones, río Paraná in Nemesio Parma, collected with the holotype.

Hoplias cf. *malabaricus*: MLP 4501, 1 ex., 101 mm SL, Argentina, Provincia de Corrientes, Manantiales. MLP 5495, 3 exs., 64-85 mm, Argentina, Paraná. MLP 6469, 1 ex., 72.5 mm SL, Argentina, Provincia de Formosa. MLP 7977, 3 exs., 105.4-278 mm

SL, Argentina, Provincia de Chaco, Municipio Resistencia, Lag. Arenosa. MLP 7995, 1 ex., 157.5 mm SL, Argentina, Chaco, Municipio Resistencia, Lag. Fabril financiera. MLP 8870, 170 mm SL, Argentina, Provincia de Formosa, Dep. Laishi, Estancia El Bagual. MLP 8869, 1 ex., 181 mm SL, Argentina, Provincia de Formosa, Dep. Laishi, Estancia El Bagual. FML-CI 6766, 1 ex, 278 mm SL (dried disarticulated skull), Argentina, Provincia de Misiones, río Paraná in Nemesio Parma, collected with the holotype.

RESULTS

Holotype.— CI-FML 6763, 224 mm SL, Argentina, Provincia de Misiones, río Paraná in Nemesio Parma (27° 21' 23.04" S – 56° 1' 1.92" W), Dep. Capital. November 2005, coll. D. Aichino, M. Azpelicueta, D. Méndez, I. Rodríguez.

Paratypes.— CI-FML 6764, 2 ex., 224–248 mm SL, collected with the holotype. LGE-P 314, 4 exs., 206.6–293 mm SL, Argentina, Misiones, Dep. Capital, río Paraná in Garupá (27° 27' 33" S – 55° 48' 41" W), December 13, 2013, coll. Staff of Proyecto Biología Pesquera Regional. LGE-P 315, 2 exs., 273–289 mm, Argentina, Misiones, río Paraná in Puerto Maní, Dep. San Ignacio (27° 6' 21.47" S – 55° 31' 5.21" W), May 2014, coll. Staff of Proyecto Biología Pesquera Regional. LGE-P 316, 2 exs., 248–293 mm, Argentina, Misiones, Dep. San Ignacio, arroyo Yabebiry (27° 17' 39.10" S – 55° 33' 32.12" W), May 2014, coll. Staff of Proyecto Biología Pesquera Regional. LGE-P 317, 2 exs, 270–293 mm SL, Argentina, Corrientes, Dep. Ituzaingó, río Paraná in Toma de Agua Eriday (27° 29' 5.55" S – 56° 40' 33.84" W), December 2013, coll. Staff of Proyecto Biología Pesquera Regional. LGE-P 318, 2 exs., 285–281 mm SL, Argentina, Misiones, Dep. Capital, arroyo Garupá, May 2014, Staff of Proyecto Biología Pesquera Regional. LGE-P 319, 1 ex., 272 mm SL, Argentina, Misiones, Dep. Capital, arroyo Garupá, November 2013, Staff of Proyecto Biología Pesquera Regional.

DIAGNOSIS

The presence of tooth-bearing plates on dorsal surface of the basihyal and basibranchials and the medial margins of contralateral dentaries converging towards the mandibular symphysis in ventral view, allow us to include the species in the *H. malabaricus* group. The presence of five brown bands transversely placed on lower jaw distinguishes the new species from its congeners, except *H. microlepis* (vs. lower jaw with small black or brown dots uniformly distributed or straight). The number of circunpeduncular scales in *H. mbigua* is 20 whereas *H. teres* and *H. malabaricus* have 18 circunpeduncular scales and *H. microlepis* 22–24, usually 24. *Hoplias mbigua* has convex dorsal profile between head and dorsal fin and large tooth plate on basihyal whereas *H. teres* has straight dorsal profile and smaller tooth plates on basihyal. *Hoplias mbigua* is distinguished from *H. microlepis* by the presence of 12–16 gill rakers on first epibranchial (vs. about 9) and 42–43 lateral line scales (vs. 43–47).

Hoplias mbigua has a large supraopercle, with its anterior margin contacting the infraorbitals 5 and 6 whereas the lectotype of *H. malabaricus* has a short supraopercle, with an anterior margin scarcely extended before anterior opercular margin. *Hoplias mbigua* is distinguished from *H. cf. malabaricus* by the dorsal surface of head scarcely or strongly concave (vs. convex in *H. cf. malabaricus*); a large eye, with the upper margin of orbit strongly marked in skull roof (vs. lateral margin of skull scarcely concave at orbit); the shape of anterior profile of head angular in lateral view (vs. rounded), and the lower head depth 45–50 % of HL (vs. more than 50 % of HL). *Hoplias mbigua* has a large tooth-plate on basihyal and basibranchials instead of two lines of tooth-plates at sides of bones in *H. cf. malabaricus*. We could not observe in the radiograph of *H. malabaricus* lectotype the size or shape of basibranchial tooth-plate.

DESCRIPTION

Morphometric data are presented in Table 1. Greatest body depth at vertical through posterior tip of pectoral fin. Body cylindrical, deeper than wider (Fig. 1). Anterior profile of head angular in lateral view, markedly angular in larger specimens. Dorsal profile of head always concave, in some large individuals concavity more pronounced; slightly convex or straight from vertical through first series of scales to dorsal-fin origin in large specimens, straight and postero-ventrally slanted under dorsal-fin base; slightly concave or straight from vertical through base of last dorsal-fin ray to origin of caudal-fin rays, independent from body size. Ventral

profile of head straight, slanted postero-ventrally; ventral profile of body slightly convex to pelvic-fin origin; approximately straight from latter point to anal-fin origin; straight and postero-dorsally oriented along anal-fin base; straight or slightly concave from base of last anal-fin ray to anterior most ventral procurent caudal-fin rays.

Dorsal margin of orbit at same level of dorsal profile of head, eye surpassing that level in many specimens independent from body size. Medial margins of contralateral dentaries forming a V shaped angle, sometimes not too abrupt (Fig. 2).

Head wide, low. Upper jaw shorter than lower jaw. Posterior tip of maxilla surpass-

Table 1. Measurements of Holotype and 15 specimens of *Hoplias mbigua*, new species. SL (standard length, snout to hypural joint): in mm. SD: standard deviation.

	Holotype	Mean	Range	SD
SL	224,0		206,6-293,0	
Percentage of SL				
Body depth	22,2	21,0	19,3-22,4	1,2
Predorsal length	46,7	45,2	42,9-49,3	1,7
Prepectoral length	29,0	27,4	25,8-28,9	1,0
Prepelvic length	54,0	51,7	46,3-54,7	2,5
Preanal length	80,4	78,8	71,8-83,4	3,4
Caudal peduncle depth	13,9	13,0	12,1-13,9	0,6
Caudal peduncle length	14,6	12,3	10,6-14,6	1,0
Anal-fin base length	10,5	9,4	8,6-10,5	0,6
Dorsal-fin base length	19,2	18,9	17,1-20,1	0,8
Dorsal fin length	17,2	16,8	14,6-19,1	1,3
Pectoral-fin length	17,2	15,9	14,1-19,4	1,3
Pelvic fin length	19,8	17,4	15,8-21,9	1,8
Anal fin length	15,0	13,9	11,9-16,6	1,3
Head length	32,8	29,5	27,5-34,5	2,0
Percentage of HL				
Head depth	49,1	47,7	45,9-50,3	1,3
Interorbital distance	23,2	25,6	23,2-27,6	1,5
Orbital diameter	16,6	15,2	13,4-17,3	1,0
Snout length	25,7	27,1	25,2-28,6	1,0
Snout width	22,7	23,5	21,4-25,6	1,0
Snout depth	15,9	15,0	9,7-18,2	1,2
Pre-nasal distance	15,2	17,1	15,2-18,4	0,9
Upper jaw length	51,4	54,4	35,2-46,7	2,1



Fig. 1. *Hoplias mbigua*, holotype, lateral and ventral views.

ing posterior margin of eye, more than half of orbital diameter in large specimens (more than 240 mm SL). Posterior portion of maxilla dorsally extended, covered by second and third infraorbitals. Upper and lower lips fleshy with skin covering canines externally. Anterior nostril tubular, separated from pos-

terior one. Anterior and posterior nostrils located in an oblique low slit, with its anterodorsal origin at level of upper third of orbit. Posterior nostril located very close to eye. Eye large, strongly entering in margin of skull roof (Fig. 3c).



Fig. 2. *Hoplias mbigua*, detail of ventral view of head with pigmented bands: a) specimen not preserved, 290 mm SL (standard length, snout to hypural joint); b) 45 mm SL; c) 68 mm SL; d) 77 mm SL.

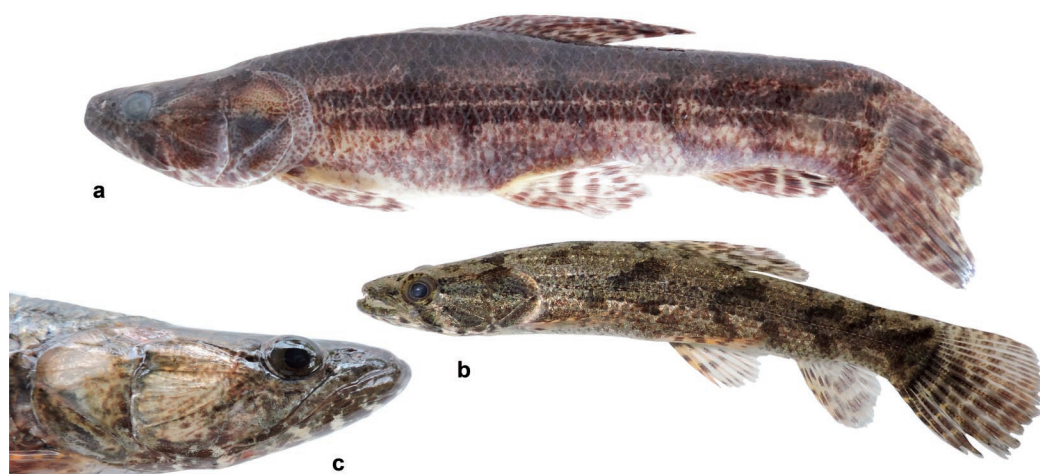


Fig. 3. *Hoplias mbigua*, lateral views. Different pigmentation patterns: a) opercular membrane completely pigmented, 293 mm SL (standard length, snout to hypural joint); b) 77 mm SL; c) specimen with 270 mm SL, very concave head and extremely large eye.

Teeth in both jaws conical or canine. Teeth and especially large canines completely covered by skin. Premaxillary teeth in a single row, all teeth canines but varying in size. First premaxillary tooth large canine, followed by a second tooth medium sized canine, two to four small canines, one medium-sized canine, one large canine, and two or one small canines. Maxilla with single row, bearing three or four small canines followed by one medium-sized and largest one, one medium-sized and 30 to 40 small canines; number of small canines increasing during growth.

Dentary with anterior external row of teeth and posterior internal row. External series with two or three small symphyseal canines followed by one medium-sized, and largest dentary canine, then several small or medium-sized canines and two larger ones. Internal series beginning immediately posterior to last conical tooth of external row and composed of numerous small canines (about 18).

Ectopterygoid and accessory ectopterygoid toothed. Ectopterygoid with one series of small conical teeth along ventral margin and a patch of many smaller viliform teeth on ventromedial surface, occupying about three

quarters of its length. Also, accessory ectopterygoid with a line of small external conical teeth and a ventral patch with viliform teeth.

Distal margins slightly rounded in all fins. Dorsal-fin rays ii,12(15*), iii,12(1). Dorsal fin located nearer snout tip than caudal-fin ray origin; its origin at vertical three scales anterior to pelvic-fin origin. Dorsal fin base a little more than twice length of base of anal fin. Longest dorsal-fin ray approximately 80% of body depth. Anal-fin base short with ii,7(1), iii,7(8), ii,8(1), iii,8(4*), iii,8(1), ii,9(1) rays. Tip of adpressed dorsal fin falling near vertical through anal-fin origin or in same line. Pectoral-fin rays with i,11(2), i,12(10), i,13(4*) rays. Pectoral-fin origin located at a vertical through middle of subopercle. Tip of pectoral fin separated from pelvic-fin origin by three to four scales in young specimens and four to five scales in larger ones. Pectoral and pelvic fins of similar size although pelvic fin always scarcely longer than pectoral fin. Pelvic-fin rays i,7(14*) or i,8(2). Pelvic-fin origin situated at midbody, approximately in a vertical through third or fourth dorsal-fin ray. Tip of pelvic fin separated from anal-fin origin by five or six scales. Caudal-fin rays i,15,i*.

Well-developed cycloid scales, imbricated

along entire body. Series of dorsal scales overlapping supraoccipital spine. Last vertical series of scales on caudal peduncle forming a relatively straight line; two or three last rows of scales on caudal-fin rays smaller than those of body. Anterior margin of scales undulated, with small notch at midpoint and posterior margin rounded. Eight to 12 *radii* extending from center of scale to its anterior margin and only two to six *radii*, extending from center of scale to its posterior margin; one to three incomplete *radii* in lateral field of many scales. Lateral line straight and complete, extending from posteroventral margin of supracleithrum to middle caudal-fin rays. Last tube of lateral line in last scale. Lateral line with 42(13*), 43(3) perforated scales. Longitudinal series of scales between

lateral line and dorsal-fin origin 6(15*), 5.5(1). Longitudinal series of scales between lateral line and pelvic-fin origin 5(13*) 5.5(3). Scales around caudal peduncle 20(15*, one specimen with 22).

Color upon capture. Dorsum brown, darker than rest of body; upper half of body dark brown and lower half scarcely lighter, sometimes iridescent; vent pale yellow. In many specimens (independent from body size), a white longitudinal band extending from posterior opercular margin to origin of lower caudal-fin rays, situated one scale below perforated scales. Some specimens, with oblique brownish bands through white band. Ground color of caudal fin dark, brown; remaining fins clear, brownish; all fins with pale yellow lines. Remarkably 5-6

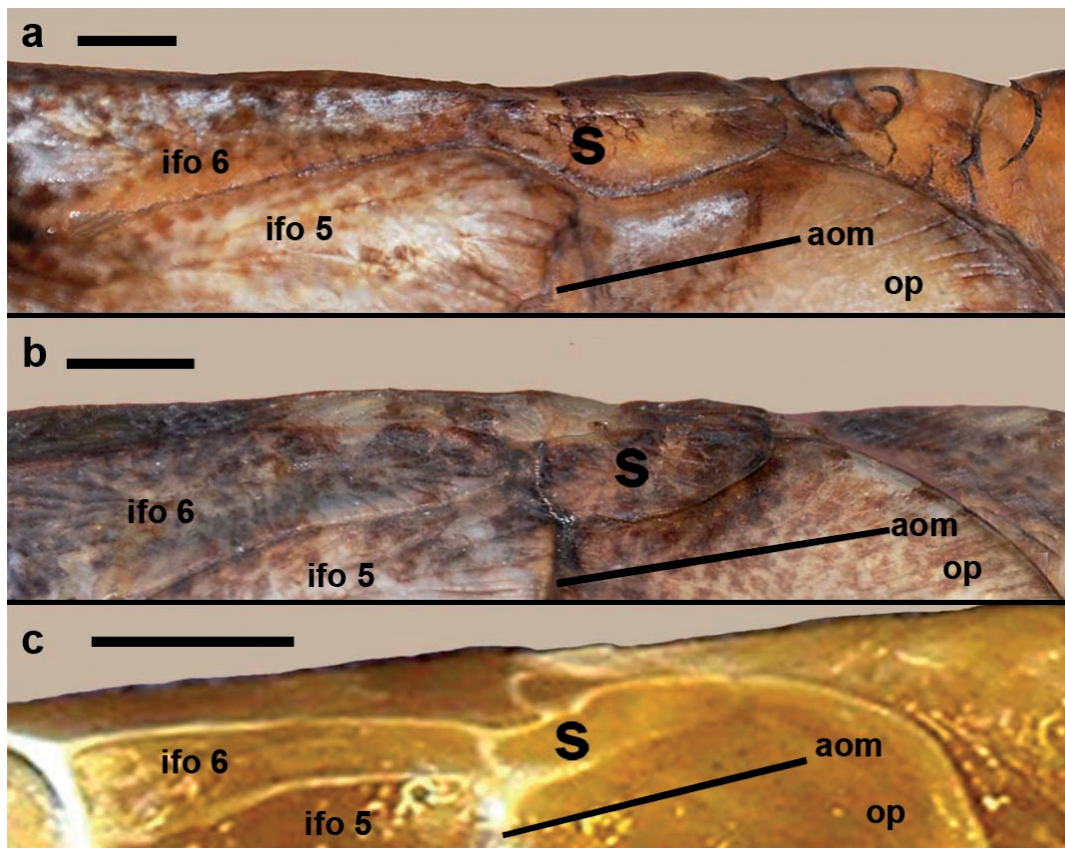


Fig. 4. Supraopercle of *Hoplias*, snout at left: a) *H. mbigua*, 280 mm SL [standard length, snout to hypural joint]; b) *H. cf. malabaricus*, 278 mm SL; c) *H. malabaricus*, holotype, 167 mm SL. aom: anterior opercular margin; ifo 5-6, infraorbital 5 or 6; op, opercle; S, supraopercle. Scale bar = 5 mm.

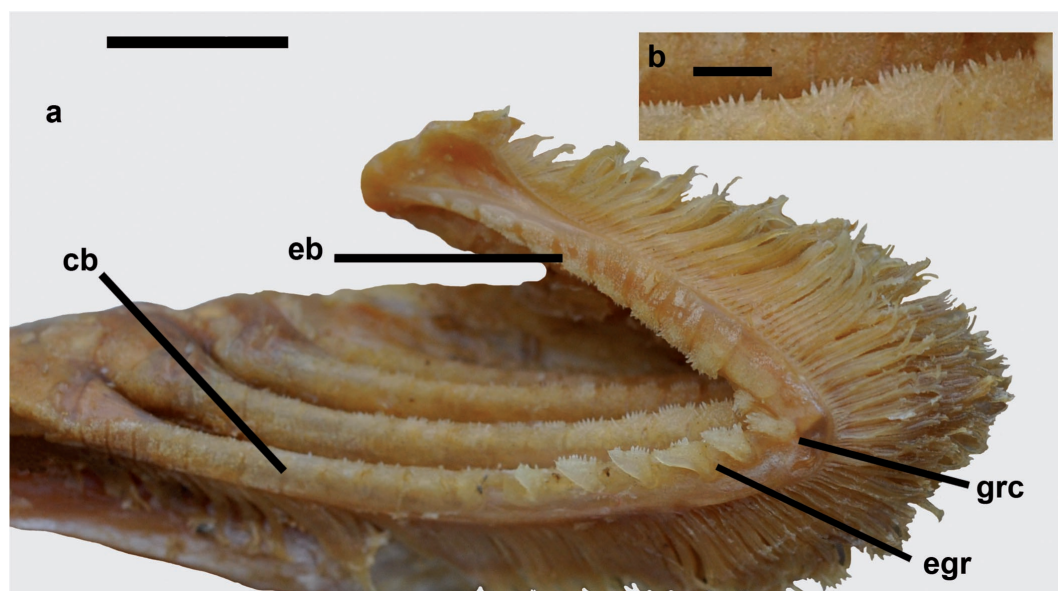


Fig. 5. *Hoplias mbigua*, 280 mm SL, snout at left: a) first branchial arch with toothed elongated and plate-like gill rakers. Scale bar = 1 cm; b) detail of plate-like gill rakers. Scale bar = 5 mm. cb, ceratobranquial; eb, epibranchial; egr, elongate gill rakers; grc, gill raker on cartilage.

transverse brown bands in opercle; 6-8 brown ventral bands from symphysis to level of posterior infraorbital margin; presence of bands in all specimens from 45 mm SL to largest one 293 mm SL (Fig. 3).

Color in alcohol. Ground coloration of body dark to light brown, darker dorsally and paler ventrally. Ventral region light yellow; many scales covering vent with a pale brown dot usually located in anterior portion of scale, more numerous in large specimens, with different shape. In most specimens flanks with a dark longitudinal band along perforated line scales, covering approximately half of the series immediately above and below lateral line; also, most specimens with a light band below dark band. Sometimes oblique dorsoposterior dark stripes occupying portions of light band (Fig. 1). Dorsal surface of head dark brown, lateral faces lighter. Sometimes, two or three bands radiating ventrally and posteriorly from eye through infraorbitals; first one on infraorbital two, second band on infraorbital three; third one, when present, on infraorbital five, sometimes continued through

opercle. Lateral and ventral surface of dentaries with 5-6 transverse brown bands, many times also visible on maxilla. Those bands extended on angular, retroarticular, subopercle, interopercle, and branchiostegal membranes. Brown bands present independent from body size (Fig. 2). Many times opercle marbled, opercular membrane dotted (Fig. 3). One small dot in dorsal half of caudal peduncle, near caudal-fin ray origin. Caudal fin dark brown, with pale yellow bands. Dorsal, pectoral, and pelvic fins pale with numerous dots forming dark bands. All fins clear in few specimens (Fig. 3c). Bands on anal fin more regular than those on remaining fins. Chromatophores of pectoral and pelvic fins located on dorsal and ventral surfaces of fins with similar pattern.

ETYMOLOGY

The name *mbigua* is a guaraní word that refers to an aquatic, riverine bird. This word is the nickname of Isabelino Rodríguez, who worked during many years in the Proyecto Biología Pesquera Regional. A noun in apposition.

DISTRIBUTION

Hoplias mbigua is known from different localities in the lower Paraná: arroyo Yabebiry, Nemesio Parma, Corpus, Garupá, Puerto Maní in the province of Misiones and Ituzaingó in the province of Corrientes.

OSTEOLOGY

Infraorbital bones well developed and horizontally elongated. Infraorbitals 3, 4, and ventral portion of infraorbital 5 partially covering preopercle. Posteroventral margin of infraorbitals 2 and 3 convex; posterior margin of infraorbitals 4 slightly convex, posterior margin of infraorbitals 5 and 6 concave (Figs. 1, 4).

All specimens examined with infraorbitals 3 and 4 completely excluded from orbital rim and infraorbital 5 contacting in great extent with infraorbital 2. In small specimens (45 to 100 mm SL), infraorbital 3 completely excluded from orbital margin although infraorbital 4 is located nearer orbital margin.

Supaopercle large, its anterior half contacting posterodorsal margin of infraorbital 5 and posterior margin of infraorbital 6 (Fig. 4a).

Twelve to 14 gill rakers on first epibranchial, two of them elongated laminae near cartilage between ceratobranchial and epibranchial; remaining gill rakers with form of small denticulated plates, one laminar gill raker on cartilage (Fig. 5). First ceratobranchial with 15–18 gill rakers, only four or five laminar and elongate; remaining gill rakers

plate-like (Fig. 5). Basihyal and basibranchials with a large tooth-plate, formed by many smaller ones (Fig. 6). Laterosensory canal along ventral surface of dentary with four pores, two pores on articular bone (Fig. 2). Total vertebrae: 42 (N = 3); precaudal vertebrae 28, caudal vertebrae 13 (N = 3).

REMARKS

Hoplias lacerdae (Rosso *et al.*, 2013) and *H. australis* (Oyakawa and Mattox, 2009) are recorded from the lower Uruguay River; type material of both species is unknown. Other two species of the genus *Hoplias* were described from Southern South America. Valenciennes (1847) described *Macrodon auritus* from Montevideo; it has been considered as *nomen dubium* by Oyakawa and Mattox (2009). Larrañaga (1923) erected *Esox tararira*, subsequently treated as *H. malabaricus* by Devincenzi (1925). The brief incomplete description of the nominal species provides little information in identifying the species and only indicates that it is a member of the genus *Hoplias*.

The *H. malabaricus* species group defined by Oyakawa and Mattox (2009) contains all species with dentaries abruptly converging towards the mandibular symphysis and with bony tooth-plates on basihyal and basibranchials. The possession of basihyal tooth plates is broadly distributed in Characiformes (Zanata and Vari, 2005). During this study, we found two different arrangements of bony tooth-plates on basihyal and basibranchials. *Hoplias mbigua* has a large plate

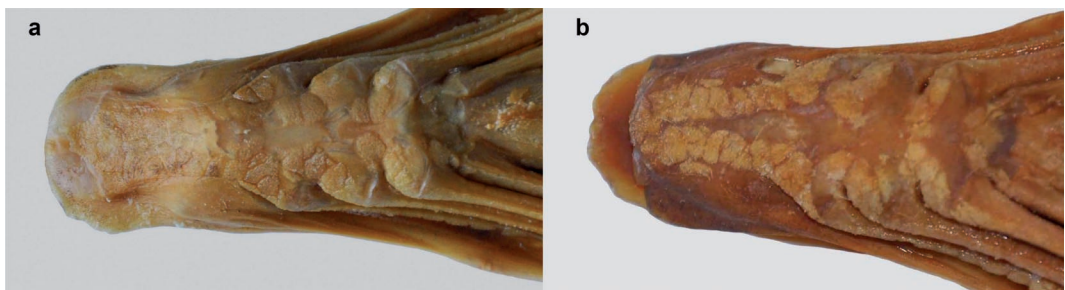


Fig. 6. *Hoplias mbigua*, detail of tooth-plates on basihyal and basibranchials, snout at left: a) *Hoplias mbigua*, 280 mm SL (standard length, snout to hypural joint); b) *H. cf. malabaricus*, 278 mm SL.

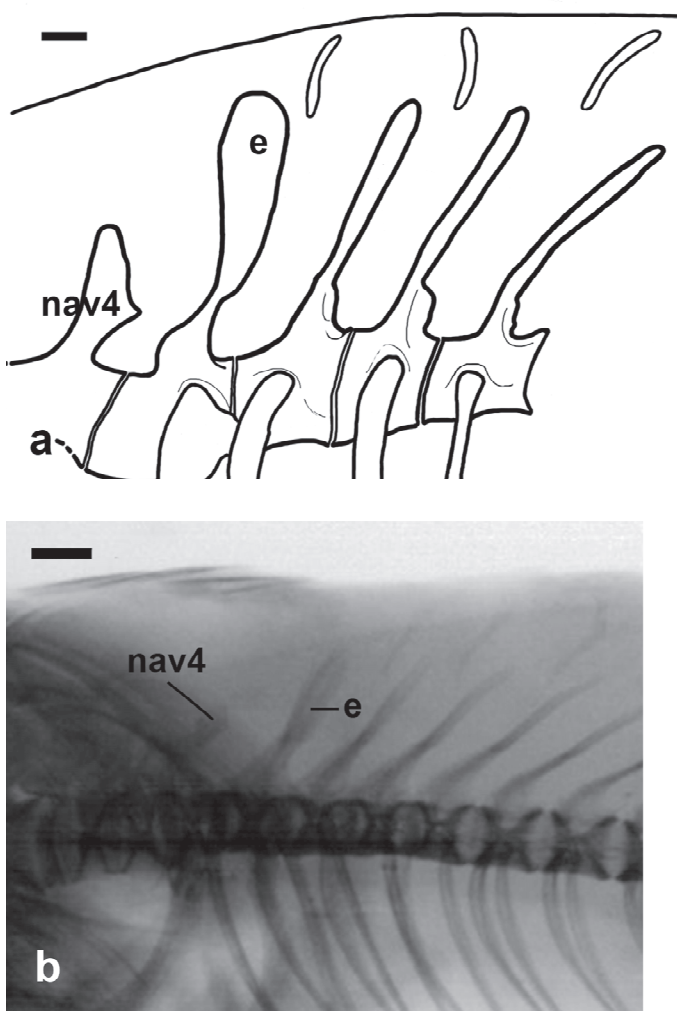


Fig. 7. Detail of the laminar expansion in the neural spine of vertebra 5; snout at left: a) schematic drawing [taken from a radiograph] of *Hoplias mbigua*, 124 mm SL (standard length, snout to hypural joint); b) radiograph of *H. malabaricus*, lectotype, 167 mm SL. Scale bar = 1 mm; e, expansion of neural spine 5; nav4, neural arch of vertebra 4.

formed by smaller ones, located medially and some plates at sides of basibranchials (Fig. 6a). *Hoplias* cf. *malabaricus* has two lateral rows of small plates, clearly separated (Fig. 6b).

The Erythrinidae has a laminar supraopercle (Roberts, 1969, page 446, Fig. 3). Zanata and Vari (2005) discussed an uncertain homology of this bone with the sensory canal segment located above suprapreopercle of other Characiformes because the laminar bone of *Hoplias* does not have a sensory

canal system. At present, in the literature, both bones appear with different names, the laminar supraopercle in Erythrinidae and Hepsetidae, above the opercle and without a canal, and the tubular suprapreopercle, as dorsal expansion of the preopercular canal (Mirande pers. com.). Two different types of laminar supraopercle are present in the species examined. *Hoplias mbigua* has a large supraopercle; the anterior third of the bone is anterior to the opercular margin (Fig. 4a). *Hoplias* cf. *malabaricus* has a short suprao-

percle, with its anterior margin approximately in the same vertical than anterior opercular margin (Fig. 4b); the lectotype of *H. malabaricus* has this condition (Fig. 4c).

In the radiograph of the lectotype of *H. malabaricus* there is a curious laminar expansion in the neural spine of vertebra 5 (Fig. 7b). All specimens examined of *H. mbigua* (Fig. 7a) and *H. cf. malabaricus* have the same structure that is not common in characiforms. Future studies of *Hoplias* will indicate the presence of this character in different species of the genus, trying to establish the phylogenetic value of the character.

Differences on karyotype structure, diploid number, chromosome banding and even sexual chromosome systems were reported in *H. malabaricus* by several authors (Bertollo *et al.*, 1997; Lopes *et al.*, 1998; Bertollo *et al.*, 2000; Pazza & Ferreira Julio, 2003; Ferreira Marques *et al.*, 2013; da Rosa *et al.*, 2014). The main framework to cytogenetic comparison have been proposed by Bertollo *et al.* (2000) who described 7 cytotypes (denominated A-G), some of them even found in syntopy and without intermediate hybrids, which reinforce the hypothesis of *H. malabaricus* as a species complex. Méndez (2007), working on specimens of *H. cf. malabaricus* and *H. mbigua* from the Paraná River in Misiones, Argentina, found two different cytotypes which also had morphological differences between them. Based on his study, the species here described would present cytotype «C» of Bertollo *et al.* (2000) with $2n=40$, metacentric and submetacentric chromosomes and no differences between sexes.

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